

## Mark Geyer Video Interview Transcript

### Assembly Lessons

I would like to talk about something's we learned from space station assembly and how the station was built up that really could apply, likely will apply to exploration missions. When we go to, let's say if we go to the lunar surface or we go to Mars and to the Martian surface, we're going to do it, were not going to do it in one big launch. You know it's not like Apollo anymore. So it's going to take assembly in space and one of the things we learned about in space station was how to build up a capability when you're launching individual pieces across the world and I think about the most complex thing I can think of was really the guidance and navigation system. Where we started out it was FGB in charge, service module docks, now service module is in charge, then the lab docks, then we get sensors on a day, that were you know Star Trekkers and other things, now we put the CMG's onboard, now when the lab comes up, now the US is in charge. So all these things are coming on different flights and they're adding capability, they have to be integrated, you have to make sure they can talk to one another. That was a very complicated dance. Same with the power system for a, on the first flight we had one set of solar arrays and then we started building out the truss, handing that over, handing the thermal system over to the big radiators. All of those were huge system transitions for fundamental capability of the station that you had to learn how to design and then test on the ground as best you could, because a lot of those you never really hook up on the ground and then make sure it works. So I think we learned a couple things, we learned we can do, we absolutely can do complex assembly. I think in my mind, we also learned that we should avoid it when we can. So I'm a big fan of the big rocket because we should minimize this assembly because it adds risk every time you do it. But even with the big rocket we're going to have some. And so when you do that you need to lay out your plans, you need to figure out whose the responsibilities are, then you got to figure out a reasonable test program on the ground to flush it out. So and also you ought to be doing enough work to look at your systems across all those, because they maybe built decades before one another. Certainly in expiration that's the case of Orion will be flying here soon and when we have the money for the lander, I don't know, it might be 15 years or so. But you ought to have an eye on the fact, and we did under Mike Griffin, we did look at the power system for example. For Orion we changed it to 120 V, which is a great system, which is the right system for a large system like spaces station or a surface system. You could fly around on 28 V but 120 V was better for a transition to a bigger architecture. So you need to keep those things in mind. I know Gerstenmaier is working hard on common things like common docking system, common docking standards so that the Japanese fly something in 20 years that's part of this they know what to build to, it costs them less to give us a capability that fits. So those are the kinds of things you need to keep in mind.

We have had a good conversation about a lot of things that I learned. I'm ready to share it with whoever has any questions, so drop me a line, come see me at the Johnson Space Center anytime.